AMENDMENTS IN THE CLAIMS

1. (Currently Amended) A channel allocation method in a CDMA (Code Division Multiple Access) communication system, comprising the steps of:

receiving from a UTRAN (UMTS (Universal Mobile Terrestrial System) Terrestrial Radio Access Network) one SF (Spreading Factor) node $C_{SF,k}$ out of 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

searching a group including the received SF node $C_{SF,k}$ in accordance with ~~the Formula (1) below~~

$$\underline{\text{For SF} \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)}$$

$$\underline{\text{For SF} > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)}$$

where, $\underline{P_1 = \frac{2^{m-1}}{4 \cdot SF}}$ and $\underline{P_2 = \frac{4 \cdot SF}{2^{m-1}}}$;

spreading a signal on a dedicated physical data channel (DPDCH) with an OVSF (Orthogonal Variable Spreading Factor) code corresponding to a selected one of the received SF node and its child nodes in the searched group; and

spreading a signal on a dedicated physical control channel (DPCCH) with an OVSF code corresponding to an SF node determined by ~~Formula 2A~~ $\underline{F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1}}$ $(k = 0,1,\ldots)$ if the n of the received SF node is the first half value halving $(2^m-1)/4$ and ~~Formula 2B~~ $\underline{F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)}}$ $(k = 0,1,\ldots)$ if the n thereof is the latter half value halving the same.

~~Formula (1)~~

$$\cancel{\text{For SF} \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)}$$

$$\cancel{\text{For SF} > \frac{2^{m-1}}{4}, \left(P_2 \cdot \frac{2^{m-1}}{4}, P_2 \cdot n\right) = (SF, k)}$$

$$\cancel{\text{where, } P_1 = \frac{2^{m-1}}{4 \cdot SF} \text{ and } P_2 = \frac{4 \cdot SF}{2^{m-1}}.}$$

~~Formula (2A)~~

$$\cancel{F\left(C_{\frac{2^{m-1}}{4},k}\right) = C_{2^{m-1},2^{m-1}-k-1} \quad (k = 0,1,\ldots)}$$

~~Formula (2B)~~

$$\cancel{F\left(C_{\frac{2^{m-1}}{4},k}\right) = C_{2^{m-1},2^{m-1}-(k-32)} \quad (k = 0,1,\ldots)}$$

2. (Currently Amended) The channel allocation method as claimed in claim 1, wherein if a spreading factor in the SF node $C_{SF,k}$ is SF=64 and an associated spreading factor for a control part is SF=256, a spreading factor $C_{control,256,127-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,k}$ of the DPDCH, and a spreading factor $C_{control,256,255-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,32+k}$ of the DPDCH in accordance with: ~~Formula (3) below.~~

~~Formula (3)~~

$F(C_{data,64,k})=C_{control,256,127-k}$

$F(C_{data,64,32+k})=C_{control,256,255-k}$

where k=0,1,2,3,....,23.

3. (Currently Amended) The channel allocation method as claimed in claim 1, wherein if a spreading factor in the SF node $C_{SF,k}$ is SF=64 and an associated spreading factor for a control part is SF=256, a spreading factor $C_{control,256,96+k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,k}$ of the DPDCH, and a spreading factor $C_{control,256,224+k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,32+k}$ of the DPDCH in accordance with: ~~Formula (4) below.~~

~~Formula (4)~~

$F(C_{data,64,k})=C_{control,256,96+k}$

$F(C_{data,64,32+k})=C_{control,256,224+k}$

where k=0,1,2,3,....,23.

4. (Currently Amended) The channel allocation method as claimed in claim 1, wherein in the case where a spreading factor in the SF node $C_{SF,k}$ is SF=128 and an associated spreading factor for a control part is SF=256, when k in a spreading factor $C_{data,128,k}$ of the DPDCH is an even number, a spreading factor of the DPCCH is mapped according to ~~Formula (5) below~~ $F(C_{data,128,k})=C_{control,256,127-k}$; when the k is an odd number, the spreading factor of the DPCCH is mapped according to ~~Formula (6) below~~ $F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\leq n\leq 7$); when k in a spreading factor $C_{data,64,32+k}$ of the DPDCH is an even number, the spreading factor of the DPCCH is mapped according to ~~Formula (7) below~~ $F(C_{data,128,64+k})=C_{control,256,255-k}$; and when the k is an odd number, the spreading factor of the DPCCH is mapped according to ~~Formula (8) below.~~

~~Formula (5)~~

~~$F(C_{data,128,k})=C_{control,256,127-k}$~~

~~Formula (6)~~

~~$F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\leq n\leq 7$)~~

~~Formula (7)~~

~~$F(C_{data,128,64+k})=C_{control,256,255-k}$~~

~~Formula (8)~~

$F7(C_{data,128,64+2n+1})=F7(C_{data,128,64+2(n+8)+1})=F7(C_{data,128,64+2(n+16)+1})=C_{control,256,207-n}$, (for $0\leq n\leq 7$), where k=0,1,2,3,...,23.

5. (Currently Amended) An uplink channel transmission apparatus for a user equipment (UE) in a CDMA communication system, comprising:

a memory for storing 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

an input unit for receiving one SF node $C_{SF,k}$ from a UTRAN;

an OVSF code allocating device for searching a group including the received SF node $C_{SF,k}$ according to ~~Formula (9) below~~

$$\text{For } SF \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)$$

$$\frac{2^{m-1}}{4} \qquad \text{For } SF > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)$$

where, $P_1 = \frac{2^{m-1}}{4 \cdot SF}$ and $P_2 = \frac{4 \cdot SF}{2^{m-1}}$, selecting one node for a data part out of the received SF node and associated child nodes from the searched group, and selecting an SF node for a control part determined by ~~Formula 10A~~ $F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1}$ $(k = 0,1,\ldots)$ if the n of the received SF node is the first half value halving $(2^m-1)/4$ and ~~Formula 10B~~ $F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)}$ $(k = 0,1,\ldots)$ if the n thereof is the latter half value halving the same;

an OVSF code generator for generating OVSF codes for a DPDCH and a DPCCH corresponding to the selected SF nodes of the data part and the control part;

a DPDCH spreader for spreading a signal on the DPDCH with the generated OVSF code for the data part; and

a DPCCH spreader for spreading a signal on the DPCCH with the generated OVSF code for the control part.

~~Formula (9)~~

$$\cancel{\text{For } SF \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)}$$

~~For SF > $\frac{2^{m-1}}{4}$, $\left(P_2 \cdot \frac{2^{m-1}}{4}, P_2 \cdot n\right) = (SF, k)$~~

~~where, $P_1 = \frac{2^{m-1}}{4 \cdot SF}$ and $P_2 = \frac{4 \cdot SF}{2^{m-1}}$.~~

~~Formula (10A)~~

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1} \quad (k = 0,1,\ldots)$$

~~Formula (10B)~~

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)} \quad (k = 0,1,\ldots)$$

6. (Currently Amended) The uplink channel transmission apparatus as claimed in claim 5, wherein if a spreading factor in the SF node $C_{SF,k}$ is SF=64 and an associated spreading factor for the control part is SF=256, a spreading factor $C_{control,256,127-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,k}$ of the DPDCH, and a spreading factor $C_{control,256,255-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,32+k}$ of the DPDCH in accordance with: ~~Formula (11) below.~~

~~Formula (11)~~

$F(C_{data,64,k})=C_{control,256,127-k}$

$F(C_{data,64,32+k})=C_{control,256,255-k}$

where k=0,1,2,3,....,23.

7. (Currently Amended) The uplink channel transmission apparatus as claimed in claim 5, wherein in the case where a spreading factor in the SF node $C_{SF,k}$ is SF=128 and an associated spreading factor for the control part is SF=256, when k in a spreading factor $C_{data,128,k}$ of the DPDCH is an even number, a spreading factor of the DPCCH is mapped according to ~~Formula (12) below~~ $F(C_{data,128,k})=C_{control,256,127-k}$; when k is an odd number, the spreading factor of the DPCCH is mapped according to ~~Formula (13) below~~

$F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\le n\le 7$); when k in the spreading factor $C_{data,64,32+k}$ of the DPDCH is an even number, the spreading factor of the DPCCH is mapped according to ~~Formula (14) below~~ $F(C_{data,128,64+k})=C_{control,256,255-k}$; and when k is an odd number, the spreading factor of the DPCCH is mapped according to ~~Formula (15) below.~~

~~Formula (12)~~

~~$F(C_{data,128,k})=C_{control,256,127-k}$~~

~~Formula (13)~~

~~$F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\le n\le 7$)~~

~~Formula (14)~~

~~$F(C_{data,128,64+k})=C_{control,256,255-k}$~~

~~Formula (15)~~

$F7(C_{data,128,64+2n+1})=F7(C_{data,128,64+2(n+8)+1})=F7(C_{data,128,64+2(n+16)+1})= C_{control,256,207-n}$, (for $0\le n\le 7$), where k=0,1,2,3,...,23.

8. (Currently Amended) An uplink channel transmission apparatus for a UTRAN in a CDMA communication system, comprising:

a memory for storing 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

an input unit for receiving one SF node $C_{SF,k}$ from a UE;

an OVSF code allocating device for searching a group including the received SF node $C_{SF,k}$ according to ~~Formula (16) below~~

$$\text{For } SF \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)$$

$$\text{For SF} > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)$$

where, $P_1 = \dfrac{2^{m-1}}{4 \cdot SF}$ and $P_2 = \dfrac{4 \cdot SF}{2^{m-1}}$,

selecting one node for a data part out of the received SF node and associated child nodes from the searched group, and selecting an SF node for a control part determined by ~~Formula 17A~~ $F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1}$ $(k = 0,1,\ldots)$ if the n of the received SF node is the first half value halving $(2^m-1)/4$ and ~~Formula 17B~~ $F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)}$ $(k = 0,1,\ldots)$ if the n thereof is the latter half value halving the same;

an OVSF code generator for generating OVSF codes for a DPDCH and a DPCCH corresponding to the selected SF nodes of the data part and the control part;

a DPDCH despreader for despreading a signal on the DPDCH with the generated OVSF code for the data part; and

a DPCCH despreader for despreading a signal on the DPCCH with the generated OVSF code for the control part.

~~Formula (16)~~

$$\cancel{\text{For SF} \leq \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4},\ n\right)}$$

$$\cancel{\text{For SF} > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)}$$

$$\cancel{\text{where, } P_1 = \frac{2^{m-1}}{4 \cdot SF} \text{ and } P_2 = \frac{4 \cdot SF}{2^{m-1}}.}$$

~~Formula (17A)~~

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1} \quad (k = 0,1,\ldots)$$

~~Formula (17A)~~

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)} \quad (k = 0,1,\ldots)$$

9. (Currently Amended) A method for assigning a first OVSF code and a second OVSF code which respectively spread data signals and control signals, in a mobile communication system having an OVSF code wherein 2^m-1 SF nodes are arranged in the form of a tree in m+1 column and the SF nodes are divided into a pair of trees having first and second half SF nodes obtained by halving first SF nodes in a column corresponding to a maximum SF, the method comprising the steps of:

each tree allocating an OVSF code corresponding to one of some SF nodes in an m+1th column which becomes child nodes of one node out of second SF nodes following the first SF nodes as the first OVSF code for spreading a control signal; and

allocating the second OVSF code corresponding to one of the remaining nodes which maintain orthogonality with said one of the second SF nodes to spread a data signal;

wherein the maximum SF node is $C_{4,k}$ (where k=0,1,2,3), the first SF nodes include $C_{4,0}$ and $C_{4,2}$, the second SF nodes include $C_{4,1}$ and $C_{4,3}$, the second SF node $C_{4,1}$ includes child nodes $C_{8,2}$ and $C_{8,3}$, the second SF node $C_{4,3}$ includes child nodes $C_{8,6}$ and $C_{8,7}$, the child nodes $C_{8,3}$ and $C_{8,7}$ are allocated as the second OVSF code for spreading the control signal, and the remaining nodes are allocated as the first OVSF code for spreading the data signal; and

wherein the first OVSF codes for spreading the data signal and the second OVSF codes for spreading the control signal are so allocated as to be mapped according to:

$$F(C_{data,64,k})=C_{control,256,127-k}$$

$$F(C_{data,64,32+k})=C_{control,256,255-k},$$

where a spreading factor of the data signal is SF=64, a spreading factor of the control signal is SF=256, and k=0,1,2,3,....,23.

10-15. (Cancelled)

16. (New) A method for assigning a first OVSF (Orthogonal Variable Spreading Factor) code and a second OVSF code which respectively spread data signals and control signals, in a

mobile communication system having an OVSF code wherein 2^m-1 SF (Spreading Factor) nodes are arranged in the form of a tree in m+1 column and the SF nodes are divided into a pair of trees having first and second half SF nodes obtained by halving first SF nodes in a column corresponding to a maximum SF, the method comprising the steps of:

each tree allocating an OVSF code corresponding to one of some SF nodes in an $m+1^{th}$ column which becomes child nodes of one node out of second SF nodes following the first SF nodes as the first OVSF code for spreading a control signal; and

allocating the second OVSF code corresponding to one of the remaining nodes which maintain orthogonality with said one of the second SF nodes to spread a data signal;

wherein the maximum SF node is $C_{4,k}$ (where k=0,1,2,3), the first SF nodes include $C_{4,0}$ and $C_{4,2}$, the second SF nodes include $C_{4,1}$ and $C_{4,3}$, the second SF node $C_{4,1}$ includes child nodes $C_{8,2}$ and $C_{8,3}$, the second SF node $C_{4,3}$ includes child nodes $C_{8,6}$ and $C_{8,7}$, the child nodes $C_{8,3}$ and $C_{8,7}$ are allocated as the second OVSF code for spreading the control signal, and the remaining nodes are allocated as the first OVSF code for spreading the data signal; and

wherein when k is an even number, the first OVSF codes for spreading the data signal and the second OVSF codes for spreading the control signal are mapped according to $F(C_{data,128,k})=C_{control,256,127-k}$ and $F(C_{data,128,64+k})=C_{control,256,255-k}$, and when k is an odd number, the first OVSF codes and the second OVSF codes are mapped according to $F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\leq n\leq 7$) and $F7(C_{data,128,64+2n+1})=F7(C_{data,128,64+2(n+8)+1})=F7(C_{data,128,64+2(n+16)+1})= C_{control,256,207-n}$, (for $0\leq n\leq 7$), where a spreading factor of the data signal is SF=128, a spreading factor of the control signal is SF=256, and k=0,1,2,3,...,23.

17. (New) A channel allocation method in a CDMA (Code Division Multiple Access) communication system, comprising the steps of:

selecting a node among a plurality of nodes having a SF (Spreading Factor) supportable for a maximum data rate in the CDMA communication system;

allocating codes corresponding to child nodes having the selected node as a mother node to a control channel; and

allocating codes corresponding to non-selected nodes and codes corresponding to child

nodes having the non-selected nodes as a mother node to a data channel corresponding to the control channel,

wherein the codes allocated to a plurality of control channels maintain orthogonality with each other, and the codes allocated to a plurality of data channels are also orthogonal with each other.

18. (New) A channel transmission method for a user equipment (UE) in a CDMA (Code Division Multiple Access) communication system, comprising the steps of:

receiving a node having a specific SF (Spreading Factor) allocated from a UTRAN (UMTS (Universal Mobile Terrestrial System) Terrestrial Radio Access Network);

selecting a node among at least one node having an identical SF as the received node;

allocating a child node among a plurality of child nodes having the selected node as a mother node to a control channel;

allocating a node among the received node and child nodes having the received node as a mother node to a data channel corresponding to the control channel;

spreading a control signal with a code corresponding to the node allocated to the control channel; and

spreading a data signal with a code corresponding to the node allocated to the data channel,

wherein a code corresponding to the selected node maintains orthogonality with a code corresponding to the received node.

19. (New) A channel transmission apparatus for a user equipment (UE) in a CDMA (Code Division Multiple Access) communication system, comprising:

an input unit for receiving a node having a specific SF (Spreading Factor) allocated from a UTRAN (UMTS (Universal Mobile Terrestrial System) Terrestrial Radio Access Network);

an OVSF (Orthogonal Variable Spreading Factor) code allocating device for selecting a node among one or more nodes having the same SF to the received node, allocating a code corresponding to anode among child nodes having the selected node as a mother node to a

control channel, and allocating a code corresponding to a node among the received node and child nodes having the received node as a mother node to a data channel corresponding to the control channel;

an OVSF code generator for generating the code allocated to the control channel and the code allocated to the data channel;

a first spreader for spreading a control signal with the generated code for the control channel; and

a second spreader for spreading a data signal with the generated code for the data channel,

wherein a code corresponding to the selected node maintains orthogonality with a code corresponding to the received node.

20. (New) A channel reception apparatus for a UTRAN(UMTS (Universal Mobile Terrestrial System) Terrestrial Radio Access Network) in a CDMA (Code Division Multiple Access) communication system, comprising:

a memory for storing nodes arranged in a tree form for each SF (Spreading Factor);

an OVSF (Orthogonal Variable Spreading Factor) code allocating device for acquiring a node among at least one node having an identical SF to a random node allocated to a specific UE, allocating a node among child nodes having the acquired node as a mother node to a control channel, and allocating a node among a random node and child nodes having the random node as a mother node to the data channel corresponding to the control channel;

an OVSF code generator for generating a first code corresponding to the node allocated to the control channel and a second code corresponding to the node allocated to the data channel;

a first despreader for despreading a control signal received from the specific UE with the first code; and

a second despreader for despreading a data signal received from the specific UE with the second code,

wherein a code corresponding to the acquired node maintains orthogonality with a code corresponding to the received node.